



# Siting of HUD -Assisted Projects Near Hazardous Facilities

A Guidebook

Acceptable Separation Distances  
from Explosive and  
Flammable Hazards



---

# **Siting of HUD-Assisted Projects Near Hazardous Facilities**

---

A Guidebook

Acceptable Separation Distances  
from Explosive  
and Flammable Hazards

## Table of Contents

---

Preface .....	iv
Introduction .....	iv
Purpose of the Guidebook .....	v
Limitations of the Guidebook .....	v
Organization of the Guidebook .....	vi
Chapter 1	
Background and General Discussion .....	1
Chapter 2	
Definitions and Terminology .....	3
Chapter 3	
Basic Data Requirements and Their Sources .....	5
Sources of Information on the Potential Hazards .....	5
Sources of Maps and Photographs .....	5
Sources of Information on Chemical Characteristics .....	6
Chapter 4	
Calculating Acceptable Separation Distances .....	7
Types of Containers .....	7
Guide to Potential Hazards .....	8
Basic Guidelines for Deciding which Containers to Use in Making ASD Calculations .....	8
Calculating ASD's for Fire .....	8
Calculating ASD for Explosion .....	8
Chapter 5	
Basic Principles .....	15
Appendix A - Regulation .....	17
Appendix B - Tank Conversion Chart (Dimensions to Gallons) .....	29
Appendix C - Basic Data Requirements Checklist .....	41
Appendix D - Request for Headquarters Analysis of Potential Hazardous Site .....	43
Appendix E - Sample Problems .....	47
Appendix F - Fire-Acceptable Separation Distances (ASD) Calculations .....	51
Appendix G - Explosion-Acceptable Separation Distance (ASD) Calculations .....	52
Appendix H - References .....	53
Appendix I - Worksheets .....	54

This Guidebook was developed to be used specifically in implementing the technical requirements of 24 CFR Part 51, Subpart C of the Code of Federal Regulations, entitled, "Siting of HUD-Assisted Projects Near Hazardous Operations Handling Petroleum Products or Chemicals of an Explosive or Flammable Nature." The material contained in the Guidebook is for the use of Department of Housing and Urban Development (HUD) staff or any other individual, organization or agency considering the location of HUD-assisted projects near materials of an explosive or flammable nature. It contains the step by step procedures for determining the acceptable separation distance (ASD) for a HUD-assisted project from a specific hazard source. The acceptable separation distance standards used in these technical procedures have been established and are found in the Regulation at 24 CFR Part 51 C (Appendix A).

The technical material contained in the April 1984 Guidebook and in this revision was prepared by Rolf Jensen and Associates of Deerfield, Illinois for the Department of Housing and Urban Development. Although the contractor is responsible for the accuracy and completeness of the technical data contained herein, the Department has attempted to verify the substance of the Guidebook, review it for accuracy, and to update it to reflect the Department's policies and views.

The first edition of this Guidebook was titled, "Urban Development Siting with Respect to Hazardous Commercial/Industrial Facilities" (HUD-777-CPD) and is so referenced in Regulation 24 CFR Part 51C; HUD Handbook 1390.2, "Environmental Assessment Guide for Housing Projects"; and HUD Handbook 1390.4, "A Guide to HUD Environmental Criteria and Standards contained in 24 CFR Part 51." *The Guidebook* is the Department's replacement for the earlier Guidebook (HUD-77-CPD). *The Guidebook, "Siting of HUD-Assisted Projects Near Hazardous Facilities: Acceptable Separation Distances from Explosive and Flammable Hazards,"* is to be used in place of the previous edition, when ever it is cited as a reference. Previous editions of the Guidebook are obsolete.

Numerous individuals contributed to the development of the Guidebook. In particular we wish to acknowledge the Project Manager, Peter Yurkonis of Rolf Jensen and Associates. From the Department of Housing and Urban Development (HUD), James Christopoulos, the Government Technical Monitor, offered valuable technical assistance in simplifying the technical guidance and procedures for determining safety distances. George Winzer, the Government Technical Representative; Antoinette Sebastian, who had the primary responsibility for the document's revision and current organization; and Wilhelmina Farmer, whose word processing skills made the completion of the Guidebook possible.

Questions or communications about the Guidebook should be directed to the Office of Community Viability, Environmental Planning Division, Department of Housing and Urban Development, 451 7th Street, S.W., Washington, DC 20410.

Under Section 2 of the Housing Act of 1949 (42 U.S.C. 1441) and the subsequent Housing and Community Development Acts of 1968, 1969, and 1974, the Department of Housing and Urban Development is mandated to assure the goal of a "decent home and a suitable (safe and healthy) living environment." The Regulation, "Siting of HUD-Assisted Projects Near Hazardous Operations Handling Petroleum Products or Chemicals of an Explosive or Flammable Nature" (24 CFR Part 51 Subpart C) and the Guidebook represent another step by the Department toward that objective.

## Purpose of the Guidebook

The purpose of the Guidebook is to provide HUD staff, community planners, architects, engineers, developers, and participants in HUD-assisted projects with the technical guidelines for determining the acceptable separation distance for the siting of residential buildings, mobile home parks or other HUD-assisted projects near stationary hazardous operations which store, handle or process chemicals or petrochemicals of an explosive or flammable nature.

Although the Regulation and Guidebook apply specifically to all HUD-assisted projects, the application of these standards can be used by anyone concerned with the safe siting of new residential development. Specifically, it describes the procedures for collecting data about a proposed HUD-assisted project site and a potential hazard and details the steps for calculating the acceptable separation distance (ASD) between the hazard and the project site.

## Limitations of the Guidebook

The Regulation lists specific petroleum products (liquids and gases) and chemicals defined as hazardous substances under Section 51.201. However, the list is not all-inclusive. There may be others, not listed, to which the regulation and the Guidebook may apply.

The Regulation applies specifically to acceptable separation distance (ASD) standards for blast overpressure and thermal radiation. It does not apply to toxic fumes which may be released during an explosion or fire. In the original formulation of the Regulation, the Department did consider toxic fumes. It was ultimately decided to limit the scope of the Regulation to the establishment of blast overpressure (explosion) and thermal radiation (fire). The development of an ASD standard for toxic fumes involves so many variables that the effectiveness of such a standard would be extremely complex and questionable. For example, a worst case scenario involving the release of toxic fumes would be dependent upon the physical and chemical properties of a substance, time of day or night, wind direction, wind velocity, humidity, temperature, terrain, specific toxicity of the substance, population exposed, and length of exposure. The Guidebook, therefore, does not address the toxic fume issue.

The Regulation also excludes high pressure gas and liquid petroleum transmission pipelines, and mobile conveyances such as barges, ships, railroad tankers and tank trucks.

The Department is aware that geographic differences and the differences in regional development activities means that some communities will be more affected than others. Neither the Regulation nor the Guidebook offer special consideration for the older industrial communities or regional differences. While environmental pollution or contamination of air, water, or soil by hazardous substances may occur during an accident, these releases are not considered in the Guidebook. Although the Department recognizes the potential dangers posed by the transport of hazardous cargo through residential and commercial districts, the Guidebook makes no attempt to address any of these issues. Finally, the Regulation and Guidebook do not consider safety issues involving high pressure natural gas transmission and liquid petroleum pipelines.

The Guidebook is primarily concerned with calculating acceptable separation distances (ASD) for HUD-assisted projects from specific stationary, hazardous operations which store, manage, or process materials of an explosive or flammable nature.

## Organization of the Guidebook

---

The Guidebook is divided into five chapters and eight appendices. Chapter 1 contains the background and general discussion and Chapter 2, the definitions, terminology and abbreviations which will be used throughout the Guidebook and to some extent in the appendices. The basic data requirements for determining acceptable separation distances (ASD) are contained in Chapter 3. It outlines and describes the steps to be followed in collecting data, determining the hazard source and type, and making a decision as to the acceptability of a proposed project site. Chapter 4 describes the calculation techniques for determining acceptable separation distances (ASD) from hazardous substances in specific containers, (unpressurized and pressurized liquid containers, diked and undiked containers). Also Chapter 4 includes the nomographs and tables for calculating ASDs for a proposed project site as well as a sample work problem. Finally, Chapter 5 cites basic guidance principles needed in making site assessments and calculation ASD's for blast overpressure and thermal radiation.

Several appendices are provided. Appendix A contains the Regulation (24 CFR Part 51C). Appendix B is the Tank Conversion Chart. Appendix C is the Basic Data Requirements Checklist. A "Request for Headquarters Analysis of Potential Hazardous Site Problems Checklist" is contained in Appendix D and Appendix E contains a sample problem. Appendix F and G lists selected Acceptable Separation Distance (ASD) calculations for both fire and explosion, respectively. Finally, Appendix H lists technical references.